CHAPTER 2
CAPITAL PLANNING FRAMEWORK

This chapter presents an overview of the FAA's capital investment planning framework. It describes key FAA planning policies; presents an overview of the FAA's mission, organization, and capital assets; restates FAA strategic planning goals; describes the processes involved in capital investment planning; and discusses high-level benefits derived from capital investment programs.

FAA capital investment planning is linked to the FAA's mission, strategic goals, and performance goals. It is consistent with applicable laws and regulations and is responsive to oversight and review. The agency's investment plans (Research, Engineering, and Development (R,E&D) Plan, Aviation System Capital Investment Plan (CIP), and National Plan of Integrated Airport Systems (NPIAS)) identify programs and resources needed to sustain, expand, and modernize the NAS. They are formulated in consultation with FAA customers and stakeholders.

The FAA uses several interrelated tools and processes to plan for and select CIP/facilities and equipment (F&E) capital investments that provide the greatest benefit to the agency and its customers. Many FAA investment-related processes are being reengineered to meet legislative mandates, to be more efficient and effective, and to adhere to changing internal policies.

Key FAA Planning Policies

The FAA's Acquisition Management System (AMS) is the umbrella directive that outlines policies, guidance, and tools to be used in agency acquisitions. It requires a mission analysis and an investment analysis to be performed prior to approval of new acquisitions. The AMS emphasizes life-cycle program management and provides the operational construct for unifying strategic and program planning efforts. Agency senior executives are involved throughout the acquisition process. FAA strategic planning policy requires the integration of agency planning, performance, and budgeting. It requires all agency planning efforts to support FAA Strategic Plan goals. FAA financial management policy outlines funding criteria for the various FAA funding accounts (R,E&D, Facilities and Equipment (F&E), and Operations (OPS)).

FAA Mission and Key Functions

The FAA is committed to providing a safe, secure, and efficient global aerospace system that contributes to national security and the promotion of U.S. aerospace safety. In keeping with its mission, the FAA performs the following key functions as specified under Title 49, United States Code, and in the Commercial Space Launch Act of 1984:

- Regulates and encourages aviation safety
- Regulates and encourages aviation security
- Develops, operates, and maintains a safe, secure, and efficient national air traffic management system
- Collaborates in developing a safe, secure, efficient worldwide civil aviation system
- Regulates air commerce to fulfill the requirements of national defense
- Assists in developing airports
- Helps mitigate adverse environmental impacts of aerospace
- Protects public health and safety, safety of property, and U.S. foreign policy and national security interests
- Ensures compliance with U.S. international obligations
- Encourages, promotes, and facilitates the U.S. commercial space transportation industry.

FAA Services

Consistent with its mission and key functions, the FAA provides these services or products:

- Establishes safety and/or security standards governing:
  - Design, production quality, and airworthiness of aeronautical products
  - Operation and continuing airworthiness of aircraft and training of airmen and aviation mechanics
  - Medical qualifications of airmen and air traffic controllers
  - Airports
  - Commercial space launches and non-Federal launch sites

  - Operation of commercial and state-owned launch sites.

- Licenses or certifies air carriers, air agencies, airmen, civil aircraft, airports, aircraft engine parts and propellers, commercial space launches, and non-Federal launch sites. The certification process also includes procedures governing cabin and cockpit operations, security, and quality control used by manufacturers to ensure that each product is properly configured for safe operation.
- Issues and maintains:
  - Certificates for the design and manufacture of aircraft, aircraft engines and propellers, materials, parts, and appliances
  - Certificates and licenses for air traffic operators, air agencies, airmen, airports, commercial space launches, and non-Federal launch sites
  - Medical certificates for airmen
  - Aircraft registration records
  - Designee appointments and monitoring.
- Monitors safety and/or security performance by:
  - Reviewing products and safety data for trends
  - Conducting inspections and surveillance
  - Investigating alleged violations and initiating enforcement action when warranted
  - Participating in accident and incident investigations.
- Operates the air traffic system by providing the following: separation assurance, traffic management, aviation information, navigation, landing, airspace management, spectrum management, search and rescue, and aviation assistance. The FAA also maintains and modernizes automation, surveillance, communications, navigation, and weather-sensing systems and related systems and facilities in support of air traffic management.
- Oversees the Federal role in the extensive national airport system consisting of more than 3,000 public use airports.
- Conducts aerospace safety education and conducts and sponsors related research to make the aviation and commercial space transportation systems safer, more modern, and efficient. The FAA also provides Airport Improvement Program (AIP) grants for airport development; administers the Passenger Facility Charge (PFC) program, which funds airport development; and provides grants for aviation-related education. Additionally, the FAA works with civil aviation authorities of other nations (through various international organizations) to establish international standards and agreements.

FAA Organization Overview

Organization Structure. The FAA is organized along principal lines of business (LOB) to establish a single point of accountability for six major products and services. These are: aviation regulation and certification, air traffic services, research and acquisition, airports planning and regulation, civil aviation security, and commercial space transportation regulation. In addition, the FAA has nine staff offices and the Free Flight Phase 1 Program Office reporting directly to the Administrator. Figure 2-1 depicts the FAA organization.

In addition to FAA Headquarters, the FAA maintains nine regional offices, two major support centers, three international offices, and numerous field offices. The regional offices, within assigned geographic areas of responsibility, provide these services:

- Air traffic management services
- Flight standards inspection, certification, and surveillance services (not provided by all regions)
- Facilities and equipment installation and maintenance services
- Airport development and certification, and employee health services
- Civil aviation security services
- Legal counsel services
- Ancillary supporting services.

Scope of FAA Capital Assets. Figure 2-2 provides a sample of FAA assets in the overall context of the NAS. The FAA maintains an infrastructure of thousands of systems and facilities to support air operations. In addition to its capital assets, the agency maintains airway structures, procedures, and other

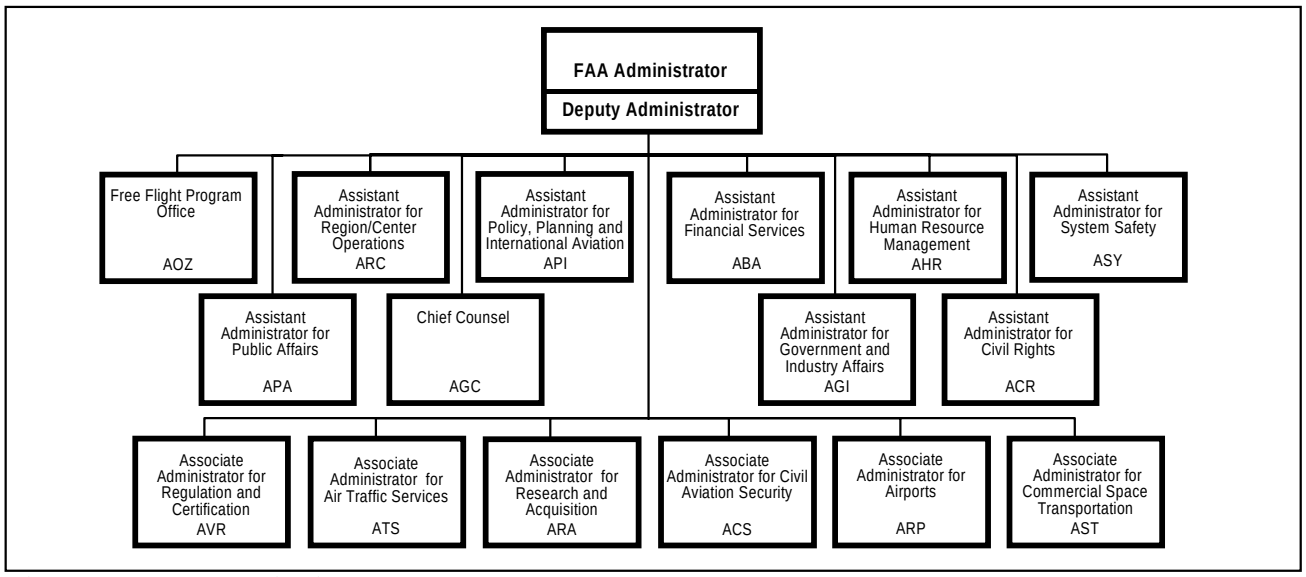

Figure 2-1. FAA Organization

system components that must be considered as the NAS infrastructure is being modernized.

The William J. Hughes Technical Center, located near Atlantic City, N.J., conducts NAS test and evaluation activities, associated field support services, and an engineering, research, and development program.

The Mike Monroney Aeronautical Center, located in Oklahoma City, Okla., conducts centralized training, central warehousing and supply, aircraft fleet maintenance, and aeromedical research; provides field support services; and manages centralized automatic data processing services for national and local programs.

The three international offices ensure continuous and effective liaison with foreign governments and the adequacy of programs and operating policies of the Europe, Africa, and Middle East Office within assigned geographic jurisdiction.

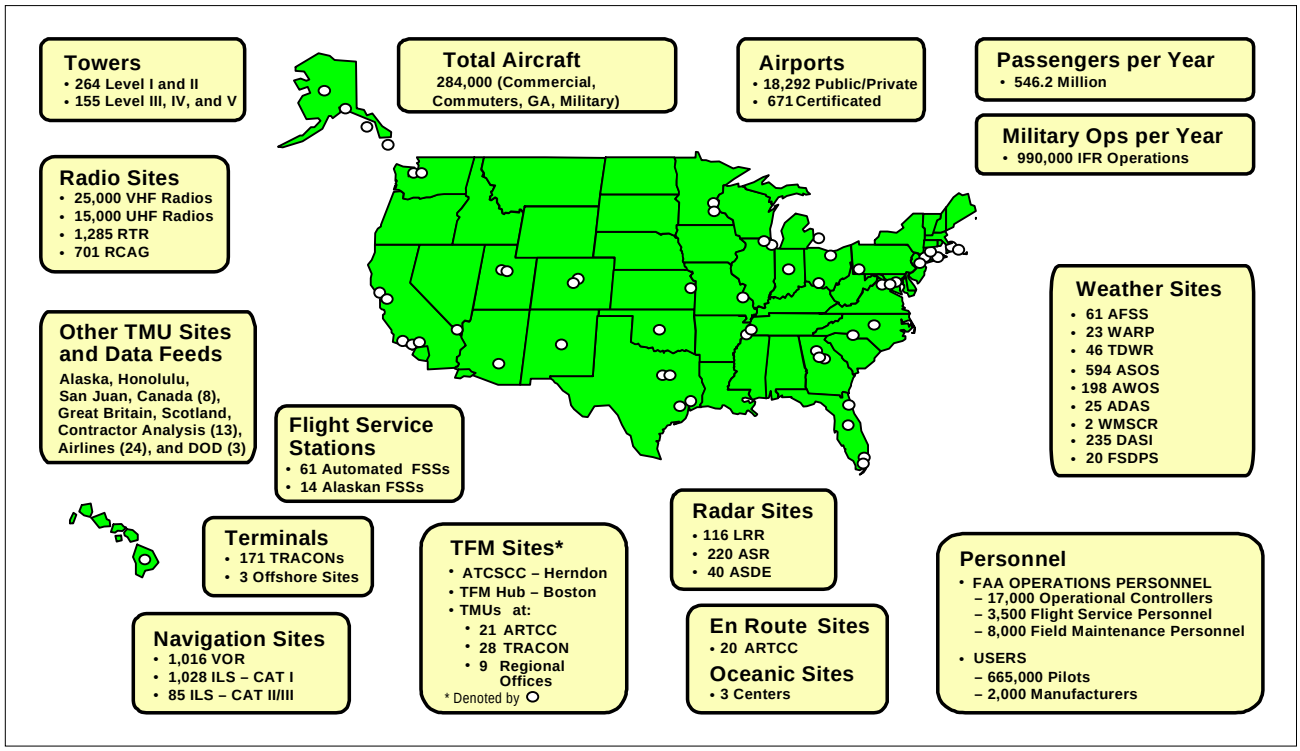

Figure 2-2. Selected NAS Assets

The following facilities provide air traffic management services: an Air Traffic Control System Command Center (ATCSCC) used to balance national traffic demand with national capacity; 22 air route traffic control centers (ARTCC) used to provide radar separation for aircraft flying at higher altitudes between terminal areas (en route airspace); 171 Terminal Radar Approach Control (TRACON) facilities used to provide separation services for aircraft operating in busy terminal areas; 419 FAA and contract airport traffic control towers (ATCT) used to control aircraft movements on the airport surface and aircraft landing or taking off at the airport; and 14 flight service stations (FSS) and 61 automated flight service stations (AFSS), which principally provide services to general aviation, including flight plan filing and preflight weather briefing services. The automated Direct User Access Terminal (DUAT) Service provides an alternative to the FSS for obtaining pilot briefing information and filing flight plans.

Although not owned or operated by the FAA, the NAS also includes the Nation's 18,000 airports that provide services to aviation system users on both the landside and the airside. The FAA plays a Federal role in over 3,000 of these airports, which are for public use (as defined in the NPIAS).

The FAA also operates a large number of mainly unmanned remote sites that support air traffic services. These include: air route surveillance radars (ARSR); radio communications air/ground (RCAG) sites; very high frequency (VHF) omnirange navigation aids (Navaids); non-directional beacon (NDB) Navaids; airport surveillance radars (ASR); remote communications outlets (RCO); interfacility communications links; and thousands of other facilities, including landing aids and weather sensors. FAA also operates maintenance support facilities located in the regions and at the William J. Hughes Technical Center (WJHTC) and the Mike Monroney Aeronautical Center (MMAC).

Facilities supporting other FAA operations and services include air carrier offices, aircraft certification offices, aviation security offices, flight standards offices, and airport district offices. Other facilities include the National Flight Data Center and the flight service field offices.

The FAA operates over 30 flight inspection aircraft to perform in-flight electronic and operational evaluation of instrument flight navigation and landing aids to ensure the safety of the NAS. R,E&D aircraft are used to increase safety and efficiency in both onboard aircraft systems and procedures as well as ground-based air traffic control (ATC) and guidance. Other aircraft are used for training and support.

FAA Personnel. In addition to the capital assets used to support its activities, the FAA employs over 47,000 dedicated people. These include air traffic controllers, flight service specialists, maintenance personnel, engineering/technical specialists and staff/administrative personnel. The majority of the personnel comprise the air traffic workforce. Maintenance technicians and safety and security inspectors comprise the next two largest groups, respectively.

FAA Strategic Planning

Capital planning to support the FAA mission and aviation users, as previously described, is part of the strategic planning process. To meet the challenges of providing safe and efficient aerospace services, FAA strategic planning is accomplished by the Administrator and all LOB's and staff offices in conjunction with FAA customers and stakeholders.

Key Agency Planning Factors. The FAA Strategic Plan supports the DOT Strategic Plan and is developed in accordance with requirements prescribed by the Government Performance and Results Act of 1993 (GPRA). The 1998 strategic plan identifies several factors (i.e., forces for change) that impact agency planning. Based on the most recent FAA forecasts, user demand for aviation services will increase, placing a strain on an air traffic control system that is already congested in many key airport and terminal areas. Commercial space activities are also expected to grow and place new demands on airspace use. User desires for system flexibility and improved system access also drive changes. New technology provides an opportunity for change as well as a challenge. An aging air traffic management infrastructure presents the FAA with choices between maintaining existing systems or replacing them with new ones.

Other planning factors include the globalization of aerospace, the prospect of reduced resources, and regulatory reform. U.S. aerospace is global—that is, U.S. aerospace interests operate, manufacture, and sell worldwide, and U.S. air passengers and freight fly all over the world. The FAA can achieve its goals only if it acts on a global basis. Acquisition reform and personnel reform legislation give the FAA an opportunity to reduce its acquisition time and costs and align its workforce with organizational goals.

The FAA has also received numerous recommendations stemming from various studies and reviews

completed within the last couple of years. These include the White House Commission on Aviation Safety and Security, the National Civil Aviation Review Commission, and the General Accounting Office (GAO). Many of these recommendations have been considered in agency strategic planning. Additionally, the FAA Strategic Plan recognizes that establishing partnerships with its employees, industry, and other stakeholders is necessary for agency success.

FAA Strategic Plan Goals and Direction. Based on agency planning factors, the FAA Strategic Plan sets long-term direction for the agency and provides the framework to match aerospace resources with initiatives. The 1998 plan lays out three mission-based goals, which focus on safety, security, and system efficiency. For each mission-based goal, the agency has developed a set of performance goals for measuring success, strategies for goal achievement, and strategic focus areas where the FAA will concentrate its efforts over the next 5 years. The strategic goals and focus areas are as follows:

- *Safety goal: By 2007, reduce U.S. aviation fatal accident rates by 80 percent from 1996 levels.* Safety strategic focus areas include regulatory reform, safety information sharing and analysis, surveillance and inspection, and accident prevention.
- *Security goal: Prevent security incidents in the aviation system.* Security strategic focus areas include establishing a baseline level of security at airports, security personnel performance and procedures, and a NAS information security architecture.
- *System efficiency goal: Provide an aerospace transportation system that meets the needs of users and is efficient in applying FAA and aerospace resources.* System efficiency strategic focus areas include NAS modernization, Free Flight, and integration (including integrating the various transportation systems, new technology into the workplace, airport/capacity needs in the NAS, and commercial space needs into the traffic management system).

In addition to mission goals, the FAA Strategic Plan identifies four enabling goals that are critical to accomplishing the agency's mission. Enabling goals focus on the *environment, global leadership, FAA reform,* and the *FAA work environment.* The agency also defines performance goals and strategic focus areas for its enabling goals. The 1998 FAA Strategic Plan contains additional details.

Performance Planning

The next step in capital asset planning is linking program performance with strategic plan mission and goals. This is accomplished through the agency's performance plans. In accordance with the GPRA, FAA's performance plans supplement the strategic plan, which establishes goals with measurable target levels of performance.

FAA Annual Performance Plan. This plan identifies and defines performance areas consistent with strategic planning mission goal areas: safety, security, and system efficiency. It also identifies performance indicators for each performance area. Performance indicators are values or characteristics used to calculate outcome measures for performance goals. An example of a performance indicator for the safety goal is "the change in the rate of aviation accidents." Performance areas link performance goals and indicators to strategic planning goals and to other agency planning activities, such as the LOB performance plans, the NAS Architecture, and the CIP. The most recent FAA Annual Performance Plan contains more details regarding performance indicators.

Lines of Business (LOB) Performance Plans. Performance plans are also developed annually by each agency LOB and staff office to support the FAA Annual Performance Plan. These plans identify services performed by each LOB and describe the contributions each LOB will make toward achieving the FAA's strategic and performance goals. They contain specific, outcome-based performance measures and identify resources and budgets needed to accomplish the goals. The CIP programs support activities outlined in agency and LOB performance plans.

Performance Reporting. The FAA develops and distributes several different reports summarizing its performance. A Master Schedule Baseline Report (MSBR) and Program Status Report (PSR) are prepared monthly by integrated product teams (IPT). Agency LOB's report performance toward strategic goal achievement through strategic planning forums. The Administrator reports performance to the Secretary of Transportation through an annual Performance Agreement and through periodic reviews. The Administrator also reports performance to the aerospace community through Challenger Sessions. The R,E&D Plan, the CIP, and the Annual Report of Accomplishments under the AIP (a report submitted by

the Secretary of Transportation) report on programs geared to specific appropriations, as required by public law. Additionally, the FAA Annual Report summarizes agencywide financial statements and accomplishments for the previous year.

NAS Architecture (Long-Term Capability Planning)

The next step in the planning phase, before acquiring new capital assets, is to analyze existing and planned capital assets, leases, and service contracts as a portfolio to identify performance gaps in meeting program requirements. The NAS Architecture assists the agency in this planning phase by identifying current and projected capabilities needed to perform agency services, capital programs associated with each capability, and assets or systems associated with each program.

Basis for NAS Architecture. The NAS Architecture is based on current agency activities, current agency strategic and performance plans, and two aviation concept of operations (CONOPS) documents: (1) *Government/Industry Operational Concept for Free Flight*, developed by the Government/Industry Select Committee for Free Flight Implementation, and (2) *Concept of Operations for the National Airspace System in 2005*, developed by Air Traffic Services (ATS) in cooperation with other FAA organizations. The joint CONOPS document was baselined by RTCA, Inc.

Together, the CONOPS documents outline a user and service provider perspective and delineate activities for implementing concepts and capabilities of Free Flight. The documents identify services the FAA intends to provide for each phase of flight. Additionally, the ATS CONOPS mandates new roles for system operators and managers. It incorporates the International Civil Aviation Organization's communications, navigation, and surveillance/air traffic management (CNS/ATM) concept.

Although it has been baselined, work is continuing on the ATS CONOPS. Lower-level ATS CONOPS documents, focusing on functional areas (for example, navigation and communications), are in progress. In addition, CONOPS documents are being developed for airports, security, aviation regulation and certification, and commercial space transportation for integration into the NAS Architecture.

Logical Architecture Description. The NAS Architecture (as previously described) is being developed at two levels: logical and technical. The logical architecture identifies high-level capabilities intended to meet aviation system user needs in the future. Several FAA programs may be required to implement only one NAS Architecture capability. The logical architecture is a multilevel, long-term, integrated plan, developed in cooperation with industry, which will be used to influence agency investment decision-making and NAS transition planning. Chapter 3 includes an overview of the process used to develop the Architecture. The NAS Architecture is driven by safety, security, user, and FAA benefits. It provides the structure and basis for acquiring new system capabilities and providing enhanced agency services. The NAS Architecture also describes system interdependencies, system and equipment transition timelines, and resource requirements. These items are included in the Capabilities and Architecture Tool (CAT) (Figure 2-3). The NAS Architecture provides input to LOB mission analyses, investment analyses, program planning, and the annual capital planning and budgeting activities.

Technical Architecture. This architecture, planned to be developed during the next 2 years, will provide requirements and standards needed to ensure that the interrelated systems are built to be interoperable and maintainable. The technical architecture will include these subcomponents:

- *Technical Standards:* Applies broadly to the NAS and includes non-program-specific standards for hardware, software, communications, data, physical security, performance, and standards pertaining to the information and information security architectures. Some of this work has already begun; a NAS information architecture and NAS information security architecture are in progress.
- *Technical Characteristics:* Linked to individual systems contained in the NAS Architecture are program/solution-specific details that include assigned standards, interfaces, data types and characteristics, data volumes, performance characteristics, facilities information, and avionics detail. These data will appear in the NAS Architecture for legacy systems, systems under development, and proposed systems.

Future NAS Architecture/Capability Update Strategy. The FAA traditionally uses the NAS requirements baseline to define NAS operational and system requirements. The current baseline is being restructured for consistency with the ATS CONOPS and the NAS Architecture. Strategic-level NAS requirements documents will be developed and maintained in the

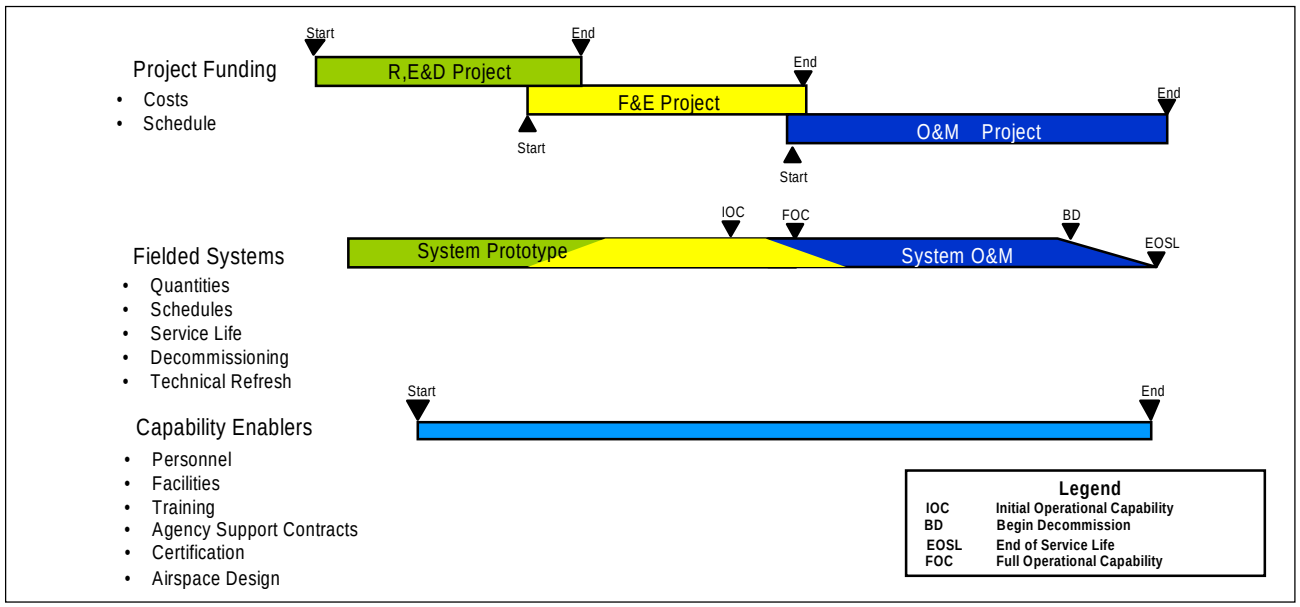

Figure 2-3. Capabilities and Architecture Tool Information

future by ongoing strategic-level mission analyses. These requirements documents will be used as input for updating the ATS CONOPS document and the NAS Architecture Version 4.0.

NAS Architecture/Engineering Process Improvements. The FAA uses a systems engineering approach to develop and implement the NAS Architecture. The systems engineering and configuration management processes are key in establishing and maintaining the NAS requirements baseline and ensuring that capabilities outlined in the NAS Architecture are realized by integrating all the critical functional disciplines needed to implement the capabilities. These multilevel processes assist the agency in modernizing and expanding the NAS infrastructure while maintaining the integrity of the NAS.

Systems engineering translates the current and future NAS operational needs into cost-effective systems to satisfy needs at the "macro" level (the entire NAS) and the "micro" level (individual NAS components/ subsystems). Configuration management is performed at various levels to maintain NAS integrity. Both processes are being reengineered to include new FAA products and to improve efficiency and effectiveness. The goal of reengineering is to reach maturity level 2, based on the FAA integrated capability maturity model (FAA iCMM), by 1999, and to reach maturity level 3 by 2001.

FAA is also working to improve the software engineering maturity level of agency organizations and major suppliers by establishing documentation standards, applying the FAA iCMM and appraisal methods, providing training, and engaging in other activities.

Information Technology (IT). Information technology represents a significant financial investment for the agency, as well as a set of essential tools and services that support multiple FAA missions, functions, and activities. IT software systems can be divided into several categories, based on the type of activities they support:

- Agency operational (applications) software
- Corporate (applications) software
- Infrastructure management software
- Operational (applications) software
- Operating system software
- Support software
- Systems software.

These categories are defined in Appendix D. IT acquisitions are incorporated into FAA's capital planning process, and all types of IT are considered in the NAS Architecture. FAA's IT policy is to:

- Apply sound information and engineering principles to life-cycle planning and acquisition of IT
- Involve users in all aspects of IT
- Leverage corporate IT capabilities
- Emphasize using open systems and shared data
- Implement recognized IT standards
- Take advantage of economies of scale.

Capital Investment Program Planning

The next three steps in capital planning are identifying functional requirements, determining alternatives to capital requirements, and selecting the best capital assets (i.e., identifying the best solution). These steps are achieved through the mission analysis and investment analysis processes. Other steps in capital planning include:

- Solution implementation
- Inservice management
- Service-life extension/decommissioning
- Planning for critical functional disciplines
- Procurement policy and planning.

Capital investment programs are established and implemented consistent with strategic, performance, and capability planning in accordance with the life-cycle AMS. In implementing the AMS, the FAA is striving for a 50-percent reduction in acquisition cycle time and a 20-percent reduction in acquisition costs. Feedback from AMS evaluations will assist the agency in determining its overall progress in meeting its acquisition reform goals.

Life-Cycle Acquisition Management System. The AMS consists of core policy, processes, guidance, and acquisition aids for all aspects of the acquisition life cycle. The system documentation is available via the Internet and is updated on a continuing basis under strict configuration control. The AMS streamlines decisionmaking and accountability within the FAA and fosters partnership between users and providers throughout the acquisition management life cycle. All corporate-level agency acquisition decisions are made by the Joint Resources Council (JRC) regardless of the source used to fund the acquisition. The JRC is an executive-level body that is responsible for key decision-point approvals in the acquisition process. It also holds major program acquisition reviews and approves the F&E and R,E&D budgets, the NAS Architecture, and major program changes.

Acquisitions are accomplished using the Integrated Product Development System (IPDS) concept. This system uses the team approach to acquisition. It cuts across organizational stovepipes and emphasizes full life-cycle responsibility (from program inception to disposal) for products and termination for services. The four levels of teams within the IPDS are the Product Team (PT), Integrated Product Team (IPT), Integrated Management Team (IMT), and Integrated Product Leadership Team (IPLT). IPT's are used for all agency acquisitions.

Figure 2-4 shows the acquisition process, which is organized into a series of phases and decision points. The circular representation of the process shows how mission analysis is translated into a viable solution, which undergoes continuous evolution and improvement until it is retired. Resource decisions are made

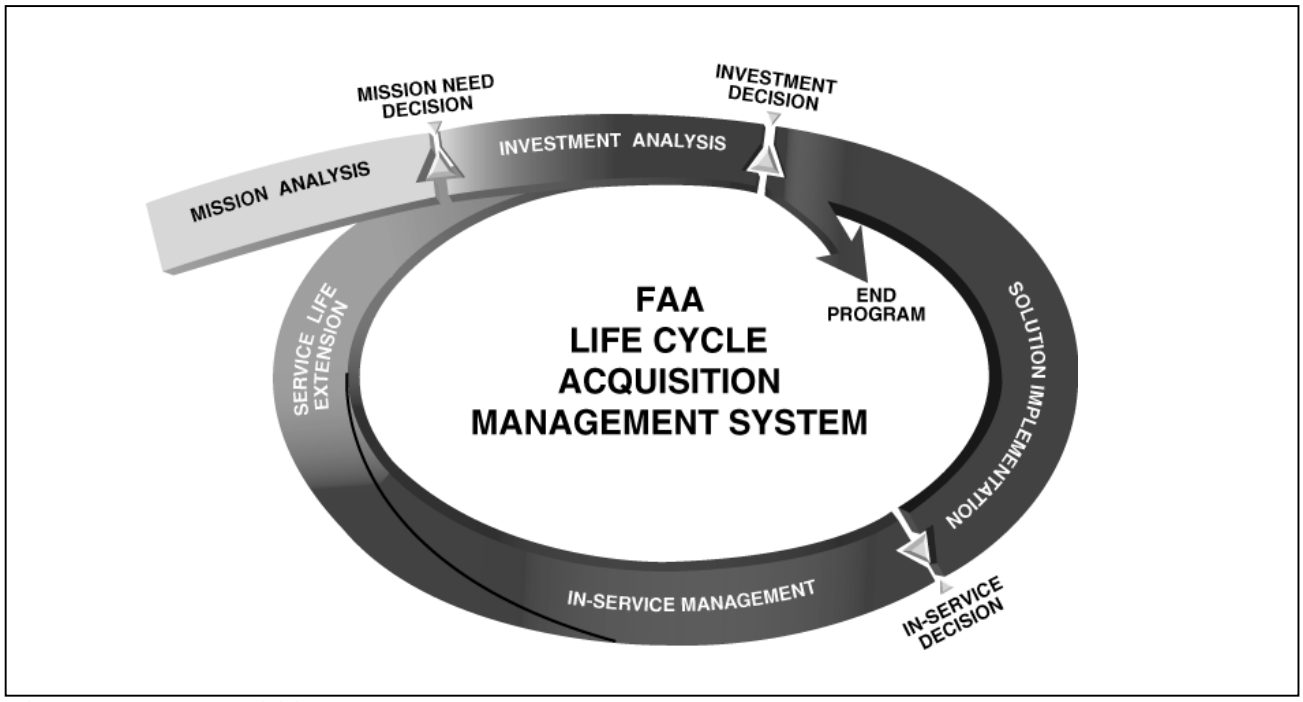

Figure 2-4. FAA Acquisition Management System, June 1997

from the corporate viewpoint based on mission need and affordability. The two corporate-level mandatory key decision points in the process are the mission need decision and the investment decision. New major acquisition programs require a favorable decision at both points to move forward in the process.

Mission Analysis. The FAA Strategic Plan mission and goals, FAA services, user needs, and the NAS Architecture provide the framework for mission analysis. The mission analysis process addresses NAS needs and all other agency mission and administrative needs. It provides a forward-looking framework for identifying and assessing the criticality of valid mission needs covering all agency appropriations. The AMS requires each LOB to engage in a continuous process for identifying mission needs. The process provides resource estimates and prioritized agency needs for consideration with other agency programs. The process also allows for noncapital solutions.

If analysis determines that a capability shortfall or technological opportunity exists, a mission need is identified and a mission need statement (MNS) documenting the shortfall or identifying the opportunity is prepared. The MNS provides a clear, unambiguous, and quantitative description of the required operational capability; the existing or emerging shortfall or technological opportunity; and the time urgency associated with the shortfall.

If approved by the JRC, MNS resource estimates are included in the NAS Architecture Data Base as a placeholder to assist the FAA in understanding total funding and scheduling impacts. New MNS (or revalidated MNS) resource estimates are also included in the CIP financial baseline and considered in F&E budget formulation. The current high-priority mission analyses in progress or planning are:

- Automatic Dependent Surveillance Broadcast (ADS-B)
- Air Traffic Control Tower System Integration
- Aeronautical Data Link System (revalidation)
- Gulf of Mexico (revalidation)
- Instrument Landing System Analysis
- NAS-Wide Information Services.

Several other mission needs are being addressed in addition to those listed above. Priorities of mission need analyses may change based on external factors.

Investment Analysis. The FAA performs an investment analysis when it determines that there is a potential need to expend funds to meet a mission capability shortfall or to take advantage of a technological opportunity. Investment analysis ends with a decision on whether or not to allocate funds. It is conducted as a partnership between the sponsoring and acquiring organizations to ensure critical needs of users are satisfied by an affordable solution. Investment analysis addresses any and all types of funds that may be used to implement a solution. The FAA conducts three types of investment analyses: new starts, program baseline changes, and service life extensions. The investment analysis process is tailored to the type of acquisition. A NAS Architecture impact assessment is performed, as necessary, to support the investment analyses.

Investment analysis teams develop initial and final requirements documents (RD) and alternative solutions to satisfy mission needs. The RD content is tailored to a system, software, facility, or services acquisition and establishes baseline criteria for selecting candidate solutions. The sponsoring organization, with support from an Integrated Requirements Team, develops the initial RD from information in the MNS. Initial RD's establish the framework for satisfying MNS's. They:

- Address operational concept, cost, schedule, benefits, physical integration, functional integration, inservice support, test and evaluation, implementation, quality assurance, configuration, human factors, and inservice management requirements
- Establish criteria for identifying potential solutions, conducting market analyses, analyzing alternatives, and performing affordability and architectural impact assessments
- Detail critical operational issues to ensure operational capability specified in the MNS is satisfied
- Record Congressional mandates, Executive orders, and Federal regulations that directly influence the requirements.

After the market analysis, analysis of alternatives, and affordability and architectural assessments, the sponsoring organization finalizes and approves the

final RD. The requirements evolution through investment analysis is shown in Figure 2-5.

An acquisition program baseline (APB) is developed for each alternative solution. APB's include funding, schedule, performance, and benefits baselines. An affordability analysis is performed across all funding accounts (R,E&D, F&E, OPS) for each alternative solution. Results of the investment analysis process are presented to the JRC for an investment decision. A positive investment decision results in a funding commitment for a program. The agreed-upon solution is then assigned to an IPT for implementation. The solution is incorporated into the NAS Architecture data base and the F&E funding baseline, replacing the mission analysis resource estimates.

The following investment analyses are currently in progress or planning:

- Facility Security Risk Management
- En Route Automation Evolution
- FAA Integrated Communications System for the 21st Century (FICS-21)
- Chicago TRACON
- Power Systems
- National Infrastructure Management System (NIMS), Phase 1
- Asset and Supply Chain Management (includes National Bar Coding)
- AFSS Voice Switch (AFSSVS) Replacement
- Aeronautical Data Link, Builds I/IA and Build II
- Runway Incursion
- NAS Information Security
- Traffic Flow Management (TFM) Infrastructure.

Solution Implementation. The APB represents a contract and is signed by the responsible IPT and the program sponsor. The IPT implements the agreed-upon solution for satisfying a mission need. Implementation begins after the JRC selects a solution and establishes an acquisition program, and ends when a new capability goes into service. Common planning activities for all programs include: identifying key planning elements; expanding team membership to include all stakeholders; developing an acquisition strategy; developing a program action plan; developing procurement and tasking packages; and keeping senior management informed of project status through program reviews and evaluations. Program reviews are conducted on a regular basis and include such topics as APB status, progress, risk assessment, and relevant issues. The FAA also conducts regular and ad hoc evaluations, as prescribed by the GPRA, to assess acquisition reform or program effectiveness. Near-term planned evaluations are outlined in the 1998 Strategic Plan.

During solution implementation, the JRC approves APB changes. IPT's are assigned life-cycle responsi-

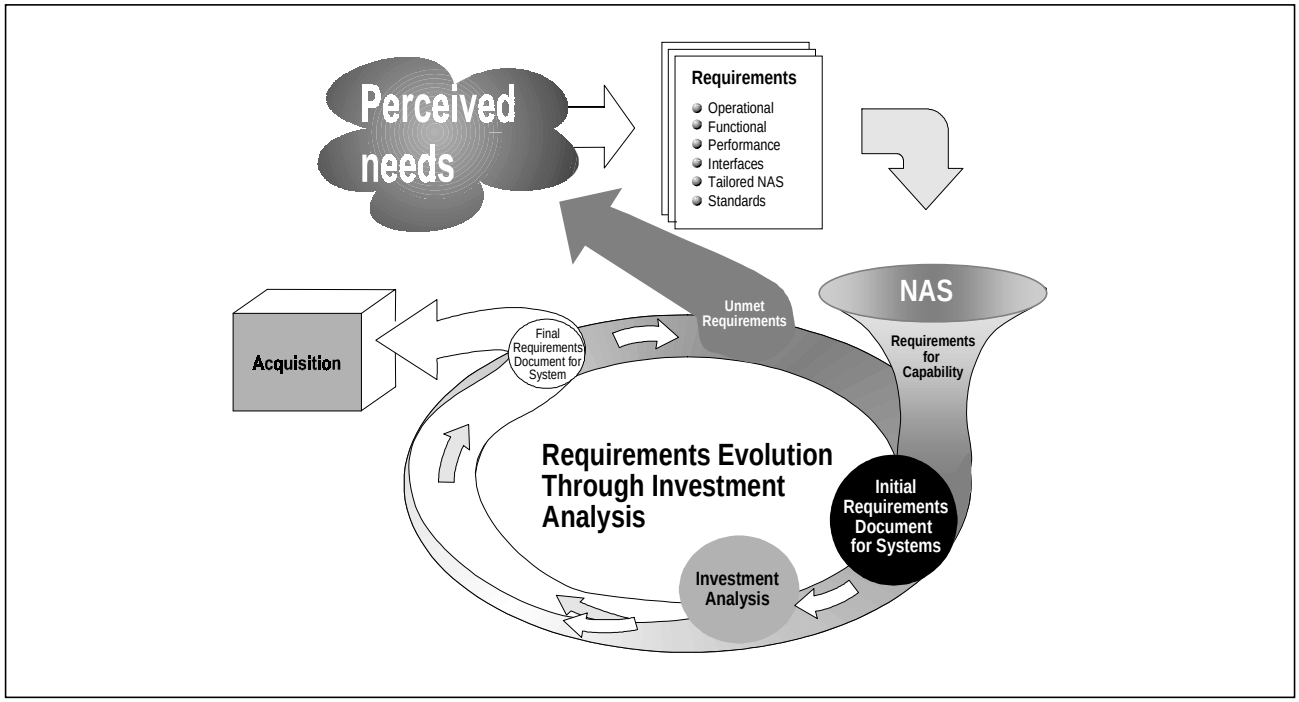

Figure 2-5. Requirements Evolution Through Investment Analysis

bility for products or services to meet user or customer needs, and they are responsible for formulating and executing their assigned budgets. Two activities occur during this phase: obtaining the solution and deploying the solution. IPT activities vary widely in obtaining a solution, depending on the type of program. In deploying the solution, IPT leadership typically shifts to members representing the implementation organization. A key decision point in the solution implementation phase is the inservice decision (ISD). The ISD determines whether a solution is ready for national deployment.

Inservice Management. Inservice management begins when a new system, software, facility, or service becomes operational and continues for as long as the product/service is in use. Funding for this phase is identified in the APB and is obtained through the NAS Plan hand-off process. This phase is characterized by a continuing partnership among the IPT and the operating and support organizations participating on the IPDS teams. Team leadership may shift to an operating organization team member when the primary focus of the team changes from acquisition to operations. Cross-functional team members work together closely to establish a framework for evolutionary product development and to identify operational problems early enough to upgrade or replace products before they become obsolete or can no longer be supported.

During this phase, preplanned product improvements may be implemented as stipulated at the investment decision. Sustainment resources in the APB may be used to upgrade components of fielded products as needed. The objective is evolutionary product development and rapid insertion of new technology, rather than periodic wholesale replacement of fielded products.

Service-Life Extension/Decommissioning. When the current capability can no longer satisfy the demand for services, or when another solution can offer the FAA more advantages, the IPT and sponsor initiate action to obtain a new investment decision. The JRC will determine whether a revalidated MNS should be satisfied by upgrading the capability, replacing the capability, or fielding a completely new solution. MNS's must be revalidated for a service-life extension investment decision.

IPT's plan, remove, and dispose of fielded products or services when they are no longer needed. Removal and restoration cost is factored into the life-cycle cost of a candidate solution during investment analysis.

Planning for Critical Functional Disciplines. FAA acquisitions require integrating many critical functional disciplines that work to field high-quality, trouble-free products or services. The disciplines vary, depending on the type of program. NAS acquisitions typically include the following:

- Airspace change management
- Procedures development
- Certification of proposed new airborne and ground equipment and related software
- Aviation spectrum management
- Information technology management
- Standards development
- Security planning
- Management of requirements
- Test and evaluation
- Deployment planning
- Logistics support
- Training
- Procurement planning
- Real property management
- Configuration management
- Systems engineering including:
  - Interface management
  - Transition management
  - Quality assurance
  - Reliability
  - Maintainability
  - Availability
  - Human factors
  - Software engineering
  - Risk management
  - Environment and energy management
  - Occupational safety and health management
  - Facility decommissioning.

FAA policy addresses the various functional disciplines, and the cost of these disciplines are considered in acquisitions.

Procurement Policy and Planning. As part of its AMS, the FAA has updated its procurement policy in accordance with the Federal Aviation Reauthorization Act of 1996, Public Law 104-264. The act gives the Administrator the final authority for carrying out

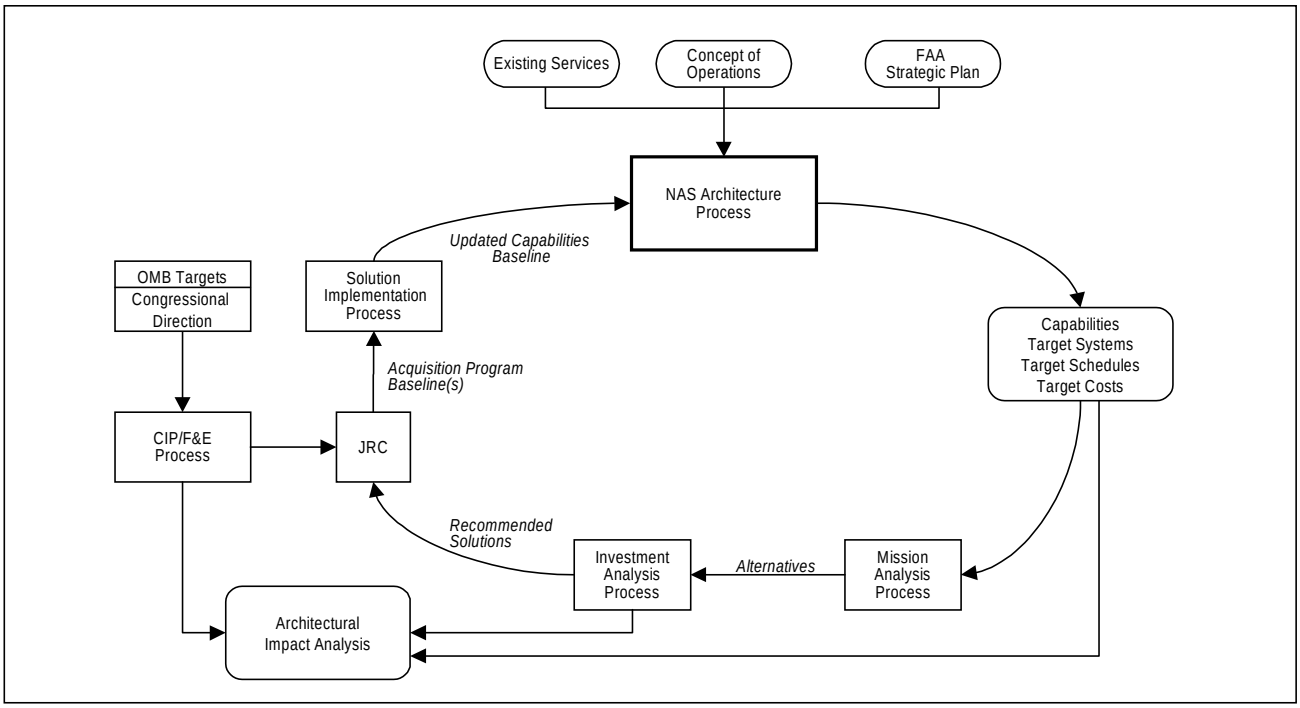

Figure 2-6. NAS Architecture Role in the Acquisition Management System

all functions, powers, and duties of the agency relating to the acquisition and maintenance of agency property and equipment. The FAA procurement system has been streamlined and emphasizes competition, delegates decisionmaking, emphasizes tailoring procedures, and additionally, permits open communications with industry from initial planning to contract award. For example, the FAA process emphasizing open communication allows potential contractors to discuss in detail FAA requirements before preparing proposals, which places contractors in a better position to satisfy FAA requirements. In addition, the FAA's process substitutes a screening information request (SIR) for the Federal Acquisition Regulation's detailed request for proposals. After each proposal is reviewed, a second SIR is sent to qualified applicants.

Acquisition Strategy Papers, developed by the IPT's, cover procurement planning. Programs not covered by an Acquisition Strategy Paper must develop procurement plans appropriate to the complexity and dollar value of the procurement. The AMS provides Internet-based automated aids to support IPT's through all procurement phases. The FAA has also developed a new automated system (Acquire) to implement its acquisition and procurement policy. The new system replaces outdated systems that do not comply with the new AMS policy.

Annual Capital Plan and Budget

The Agency Capital Plan is the ultimate product of the planning phase. It reflects the decision and tradeoffs made in the planning process and describes new acquisitions proposed for funding.

All activities described previously are ongoing activities that support FAA's capital investment planning. In addition, the FAA implements an annual capital planning process, which updates and prioritizes FAA's capital investment portfolio and supports F&E budget formulation, updates the Architecture/CIP financial and schedule baselines, coordinates and evaluates internal F&E/CIP program activities, and updates the CIP.

NAS Architecture Role. The NAS Architecture, as a top-down, long-term resource plan, forms the framework for short-term programming and budgeting for the F&E appropriation. The NAS Architecture V4.0 balances the capabilities requested by users and service providers, the funding level and sources that are expected to be available for modernization, the cost to users and their ability to equip, and the FAA's ability to manage changes needed to make modernization a reality. It includes funding and schedule baselines for all F&E projects and other capital investment projects over the long term. Figure 2-6 depicts the relationship of the NAS Architecture process to other capital-investment-related activities.

To support CIP development and budget formulation processes, the NAS Architecture is updated, based on OMB planning guidance, FAA and user priorities, and other information. The resulting plan and interdependency information are used as input to CIP development and CIP/F&E budget formulation activities. The NAS Architecture and CIP financial baselines are continually refined throughout the CIP process. The development strategy for the NAS Architecture near-term plan and the CIP financial baseline are approved by the JRC.

CIP Coordination and Update. The CIP is a multiyear plan beginning in the current year. The CIP describes the capital planning process, reports status on funded programs, documents new program requirements through the budget year, and summarizes new mission needs expected to require funding within 5 years past the budget year.

The CIP is updated and coordinated in parallel with the F&E budget process. Using the previous plan as a foundation, the CIP is updated by analyzing input from the most recent high-level planning guidance, NAS Architecture, budget formulation and execution processes, IPT and Program Office status information, and other sources.

F&E Budget Formulation. The NAS Architecture serves as the initial baseline for CIP/F&E budget formulation. After the baseline is refined through the CIP/F&E process, the budget is prepared, and the budget funding level is approved by the JRC. The Architecture/CIP financial plan is refined, based on JRC input, and subsequently approved by the JRC. The strategies or assumptions for developing the FY 2000 plan were to:

- Accomplish NAS modernization (fully fund Free Flight Phase 1)
- Maintain the current system operation
- Protect current major acquisition programs
- Meet security requirements
- Address the backlog of facility programs
- Provide for identified new starts.

F&E Interface with Airports. Currently, the FAA supports airport development projects by providing Navaids, lighting, ATCT's, radar, and weather sensors. The three FAA programs for supporting airports include the AIP, F&E, and the non-Federal program. Eligible development under AIP includes land, airfield paving, lighting, utilities, Navaids, weather sensors, safety equipment required for airport certification, certain security equipment, snow removal vehicles, and limited terminal buildings. AIP grant requests are submitted to the FAA airports offices, and AIP grants are evaluated and ranked by priority. The FAA is required by law to take over AIP-funded instrument landing systems (ILS) (including ancillary aids) for maintenance. This accounts for a relatively small number of Navaids coming into the FAA inventory every year.

The criteria for qualifying for a federally provided Navaid are established under Airway Planning Standard Number One (APS-1). The standard outlines, by number and type of approaches (air carrier, general aviation, charter, military, and cargo), the benefit to an airport for precision approach Navaids. Until recently, these facilities were considered entitlements by qualifying airports. To obtain airport requirements in the past, the FAA sent out an F&E request for all the Navaid types that the agency was planning to acquire. Based on the responses within the region, candidate locations were qualified, and an appropriation request was submitted as part of the FAA budget request. Based on the authorizations, equipment was acquired, installed, and commissioned. In anticipation of widespread use of satellite-based instrument approaches, the FAA has not submitted a request to acquire any airport-based Navaids during the transition to reliance on satellite-based approaches.

The non-Federal program was created for airports that require Navaids, but do not qualify for Federal funding under APS-1, or that are willing to spend their own money to receive Navaids faster than either the F&E program or the AIP program can provide them. Where the airport does not qualify under APS-1, a non-Federal sponsor can acquire a Navaid from an approved list and enter into an agreement with the region. The non-Federal sponsor maintains the equipment, and the FAA conducts ground and flight inspections of the facility at appropriate intervals (typically once a year). When the airport qualifies under APS-1, but wants to accelerate acquisition of a Navaid, the airport can buy the Navaid directly from the manufacturer (from the approved for takeover list), and the FAA can agree to take over the Navaid for maintenance. This is the preferred method for an airport to acquire a Navaid during the transition to satellite-based navigation. This is called a takeover and is administered under the non-Federal program.

The PFC program was added in 1990 to allow commercial service airports to impose fees for each en-

planed passenger. PFC's are fees that may be imposed by commercial service airports that annually enplane 2,500 or more passengers and have scheduled passenger service. PFC's are considered local funds, not Federal grants, although FAA approval is required to impose and use the fees collected.

In addition to AIP, PFC, and F&E funding, airports receive state, local, and private funding. The multiplicity of project funding sources necessitates careful coordination on planning and development projects to meet airport requirements and FAA strategic goals. To enhance capital planning, several activities are underway to strengthen FAA coordination among the airports and air traffic management system requirements.

Demand for FAA Services

Understanding the demand for agency services assists the FAA in identifying its performance gaps. As previously described, the FAA provides many services to airspace users, the flying public, the aviation industry, and the public at large. The primary demand is for air traffic management services, the process of efficiently clearing aircraft from origin to destination while maintaining safety. The numerous other demands placed on the FAA include:

- Safety:
  - Conducting aircraft safety inspections
  - Certifying new aircraft and avionics
  - Testing and certification of pilots
- Capacity:
  - Disseminating information to airspace users
  - Maintaining the NAS infrastructure
  - Introducing new technologies
  - Strategic planning for the future
- Security:
  - Maintaining security at airports, FAA facilities, and in flight
- Environmental:
  - Responding to environmental concerns.

Forecasts of Air Traffic Management Demand

In planning to meet future demand, the FAA and numerous other organizations forecast demand for air travel. These forecasts are used to determine the capacity required of various NAS elements, the amount of aircraft production capacity to be built by airframe manufacturers, the number of aircraft ordered by airlines, the number of flights scheduled by airlines, etc. FAA forecasts indicate continuing growth in demand for air traffic management services well into the 21st century.

Table 2-1 summarizes the operational diversity of total NAS activity for 1997, as well as anticipated demand for 2000, 2005, 2010, 2015, and 2020. Projections indicate that passenger traffic in the United States will double by 2020. Detailed information appears in FAA Aviation Forecasts Fiscal Years 1998–2009 (March 1998) and FAA Long Range Forecasts Fiscal Years 2010, 2015, and 2020 (June 1998).

Aircraft Operations and Passenger Emplanements. Aircraft operations (including takeoffs and landings at all FAA and contract towered airports) are anticipated to grow by 37 percent between 1997 and 2020. Increased commercial activity is expected to account for most of this growth. Air carrier activity is expected to increase by 64.8 percent, commuter/air taxi by 55 percent, and general aviation by 25.1 percent. Military activity is expected to decline by about 1.0 percent annually over the next 2 years, then remain constant at about 2.4 million operations per year through the remainder of the forecast period. Itinerant operations are expected to increase 43.3 percent. (Itinerant operations refer to those aircraft departing to or arriving from an area outside an airport's local operating area.)

Instrument operations represent a separation service provided to aircraft while they are conducting flight in accordance with instrument flight rules (IFR). Combined annual instrument operations counts at FAA and contract towered airports are forecast to increase from 48.5 million in 1997 to 69.3 million in 2020, an annual increase of 1.6 percent. FAA en route centers are expected to handle 61.8 million IFR aircraft in 2020, an increase of 1.8 percent annually. Combined automated and non-automated FSS operations, including pilot briefings, flight plan origination, and aircraft radio contacts will increase by 7.5 percent. Air carrier domestic enplanements are expected to increase by 3.2 percent annually during the forecast period and commuter enplanements by 4.6 percent.

Aircraft Hours, Fleet, and Pilots. Air carrier hours flown are forecast to increase 3.1 percent annually and general aviation hours flown to increase 1.3 percent annually. The number of air carrier aircraft will increase by 2.9 percent annually, commuter aircraft by 2.5 percent annually, and general aviation aircraft

Table 2-1. Current and Future NAS Activity

	1997	2000(A)	2005(A)	2010(B)	2015(B)	2020(B)
NPIAS Airports 1/	3,344					
Airport Operations (Millions)						
Total Tower/Non-Tower Operations /2						
Aircraft Operations	121.3	124.1	128.3	132.5		
Itinerant Operations	76.2	78.7	82.4	86.2	81.8	
Total FAA Tower/Contract Operations	63.4	65.9	71.1	76.4	62.9	87.1
Total FAA Tower Operations 3/	53.1	53.5	58.0			
Military FAA Tower Operations	1.9	1.8	1.8			
Total Contract Tower Operations 4/	10.3	12.4	13.1			
Military Contract Tower Operations	0.6	0.6	0.6			
ARTCC Operations (Millions)						
IFR Aircraft Handled	41.4	43.2	47.8	52.5	57.2	61.8
Large Consolidated TRACON Operations (Millions) 5/						
IFR Aircraft Handled	47.8	49.8	54.4			
FSS Services (Millions)	34.5	34.2	33.3	32.8	32.3	31.9
Flight Plans, Briefings	30.8	30.8	30.2	29.8	29.4	29.0
Radio Contacts	3.7	3.4	3.1	3.0	2.9	2.9
Hours FLown (Millions)						
Air Carrier	12.7	13.3	16.6	19.8	22.7	25.4
Commuter	3.7	4.3	5.5	6.7	7.9	9.1
General Aviation	26.5	27.8	29.9	31.8	33.7	35.6
Military						
Domestic Passengers (Millions)						
Air Carrier	542.3	596.62	711.5	851.5	989.6	1,127.7
Commuter	61.9	73.9	96.8	122.5	147.9	173.4
Aircraft Fleet (Thousands)						
Air Carrier (B)	5.0	5.4	6.6	7.6	8.7	9.7
Commuter (B)	2.1	2.4	2.8	3.1	3.4	3.7
General Aviation/Air Taxi	189.3	195.6	205.3	214.8	224.4	234.0
Civil Helicopter	6.4	6.6	6.7	6.8	6.9	7.0
Military Helicopter						
Pilots (Thousands)						
Instrument Rated	297.4	311.3	337.2	354.5	376.6	388.7
Total Pilots	616.3	675.2	761.3	798.4	853.3	872.3

1997=Actual
(A)=FAA Aviation Forecasts Fiscal Years 1998–2009, March FAA-APO-98-1
(B)=FAA Long-Range Aviation Forecasts Fiscal Years 2010, 2015, and 2020 June FAA-APO-98-9
1/ As of January 1997, National Plan of Integrated Airport Systems (1998)
2/ FAA Terminal Area Forecasts Fiscal Years 1997–2010, November 1997
3/ FAA towers=290 in 1997, 267 thereafter
4/ Contract Towers=160 in 1997, 183 thereafter
5/ Instrument operations at FAA towered airports

by 0.9 percent annually. The number of pilots will increase by 1.5 percent annually.

Military Aviation Requirements. The diverse aspects of military flight operations in the NAS require both FAA and military ATC facilities to be equipped and staffed to provide appropriate levels of service. The FAA provides approach control services for over half of the military airfields in the United States. The military services provide and operate radar approach control and ground control approach facilities and control towers that support military flight operations. Within their area of assigned responsibility, these facilities provide ATC services to the public that are equivalent to services provided by FAA facilities. The Department of Defense operates over 16,000 aircraft within the NAS. A variety of military operations designed to meet training, aerial refueling, and test and evaluation goals require special use airspace. These airspace requirements necessitate close coordi-

nation between the FAA and military organizations to optimize airspace use by civil and military users.

Airport Operations. Today, civil airports handle about 121 million aircraft operations, enplane over 630 million passengers, and accommodate over 284,000 aircraft annually.

Airport activity will increase substantially by 2020. Although most airports will have adequate capacity through the turn of the century, many of our key metropolitan areas are now congested, and many more are expected to become congested before the turn of the century. In many metropolitan areas, there is little or no reserve capacity, and the potential for expansion is limited. Though only a relatively small percentage of airports are involved, they handle a disproportionately high percentage of scheduled passengers. Today, the 29 largest commercial airports enplane approximately 66 percent of all passengers.

Other Demand

Growing demand for air travel and transport places demands on the FAA for other than air traffic management services. These demands require an FAA response that uses an ever-increasing portion of its overall funding, personnel, and hardware/software resources.

Security. As outlined in *A National Security Strategy for a New Century,* dated May 1997, the FAA is responsible for establishing and enforcing aviation security regulations, policies, and procedures that are applied by air carriers and U.S. airport operators. These include airline passenger and baggage screening for weapons and explosives. The FAA is also responsible for physical security at FAA facilities and the security of ATC data and communications.

The Federal Government has recognized aviation security as a major element of our national security strategy against terrorism. The FAA is subsidizing some capital expenses of air carriers by purchasing explosives detection systems and other advanced security equipment, as explained more fully under CIP program M33.

The FAA challenge is to develop and implement effective systems and procedures for maintaining security while striving for efficient movement of passengers and their baggage through terminals.

Aircraft Safety Inspections. Recent events have underscored the need for heightened aircraft scrutiny, especially as the airframes and engines age. As the fleet size increases (Table 2-1), the FAA will be called on to perform and/or manage correspondingly more safety inspections and to certify the larger number of aircraft.

Maintenance of Legacy Systems and Facilities. As equipment ages, it becomes increasingly expensive to maintain. Not only is equipment breaking more often, but fewer parts are available from vendors. When parts are not available, the FAA is forced to use expensive solutions, such as alternative sources, substitute parts, remanufacture, emulation, or redesign. In addition, many of FAA's facilities need refurbishing. Table 2-2 shows the ages and quantities of some of FAA's critical systems and facilities.

Commercial Space Transportation Demand. Forecasts for demand in this area are in progress and will be presented in future versions of this plan.

Overview of CIP/NAS Modernization Benefits

A key benefit of NAS modernization will be the system's ability to handle increasing air traffic growth. The benefits of fielding CIP projects to handle expected traffic increases outweigh the costs associated with implementing them.

User Benefits. User benefits include enhanced safety, more efficient routing, reduced delay, and improved flight services. NAS modernization will bring other improved services to users including: increased user access to critical NAS information to improve FAA/user collaboration and cooperation; increased predictability of NAS operations; increased NAS flexibility to meet individual user needs; and reduced traffic delays on the ground and in the air.

Maintaining and Improving Current Services. Other benefits of NAS modernization include providing existing services more efficiently. This is done by improving workforce productivity and by providing current and new services at the lowest possible cost. NAS modernization efforts are important to continue enhancing workforce productivity to meet these projected demands on the NAS. Productivity increases are expected for air traffic controllers and flight service specialists over time. Also, investing in new facilities, infrastructure, and equipment through the CIP will help reduce maintenance requirements because new equipment is less maintenance intensive than old equipment.

Environmental Benefits. In conjunction with NAS modernization efforts, the FAA has developed and is implementing specific mandated programs in the areas of environmental compliance, occupational

Table 2-2. Average Age of Selected NAS Facilities/Systems

System/Facility	Average Age (Years)	Quantity	Year of Replacement
Control Facilities			
Air Route Traffic Control Center (ARTCC)	37	21	None planned; significant modernization
Terminal Radar Approach Control	31	170	3–5 TRACON/ATCT planned replacements per year
Air Traffic Control Tower (ATCT)	27	419	
Computer and Display Systems			
Automated Radar Terminal System (ARTS) Data Displays	24	100	98–04
Automated Radar Terminal System (ARTS) Radar Displays	13	200	98–04
Direct Access Radar Channel (DARC)	11	20	02–05
Display System Replacement (DSR)	N/A	1	98–00
Host Computer	10	23	02–05
Communications Systems and Facilities			
Remote Center Air/Ground Communications	23	701	04–12
Remote Transmitter/Receiver	18	1,265	04–12
Radar Systems			
Air Traffic Control Beacon Interrogator (ATCBI)-4	26	81	99–03
Air Traffic Control Beacon Interrogator (ATCBI)-5	21	162	99–03
Airport Surveillance Radar (ASR)-7	19	35	99–02
Airport Surveillance Radar (ASR)-8	16	70	99–02
Airport Surveillance Radar (ASR)-9	6	119	15–17
Air Route Surveillance Radar (ARSR)-3	16	22	01–04; service life extension project
Terminal Doppler Weather Radar (TDWR)	3	42*	17–19

*Does not include Andrews AFB, FAA Aeronautical Center, or FAA Technical Center

safety and health compliance, and energy conservation. The programs apply to acquisition of new and existing equipment and facilities and disposal.

Global Leadership Benefits. NAS modernization is expected to effect global aviation benefits that include enhanced efficiency in air transportation and a globally harmonized air transportation system.